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Effect of macro-roughness on solitary wave breaking

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This numerical study aims to analyze the effect of macro-roughness on solitary wave breaking. Wave breaking is simulated by solving Euler equations with a two phases incompressible flow model. The hyperbolic system of conservation laws is solved with a finite volume discretization on unstructured grids. An artificial compressibility approach allows a fully explicit scheme for an efficient parallel implementation. The numerical model is based on a low Mach number preconditioning and a second order Riemann solver.
Several test cases are performed to determine the influence of macro-roughness on the breaking dynamics. The influence of the macro-roughness elements on the solitary wave breaking is shown to depend on two dimensionless ratios D/A and H/A, where D, H and A are the separation distance between macro-roughness elements, the height of the elements and the wave amplitude, respectively. Significative effects are observed for large values of D/A and H/A, with strong impairments of the successive cycles of impact/splash-ups/rebounds and reduction of the runup distance.